

MICHIGAN
FOREST PEST DETECTION PROGRAM
REPORT FOR 1961



COMPILED BY:

FORESTRY DIVISION, MICHIGAN DEPARTMENT OF CONSERVATION

COOPERATORS:

**STATE DEPARTMENT OF AGRICULTURE, U. S. FOREST SERVICE,
MICHIGAN STATE UNIVERSITY, UNIVERSITY OF MICHIGAN,
PRIVATE FOREST INDUSTRY**

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Cover: The cover drawing is of a jack pine budworm moth, the most important insect pest of pole size and larger jack pine in Michigan.

INTRODUCTION

The Michigan Forest Pest Detection Program provides a coordinated approach to the problem of forest insects and diseases on a statewide basis, employing the facilities of the various cooperating agencies, each contributing in its respective field.

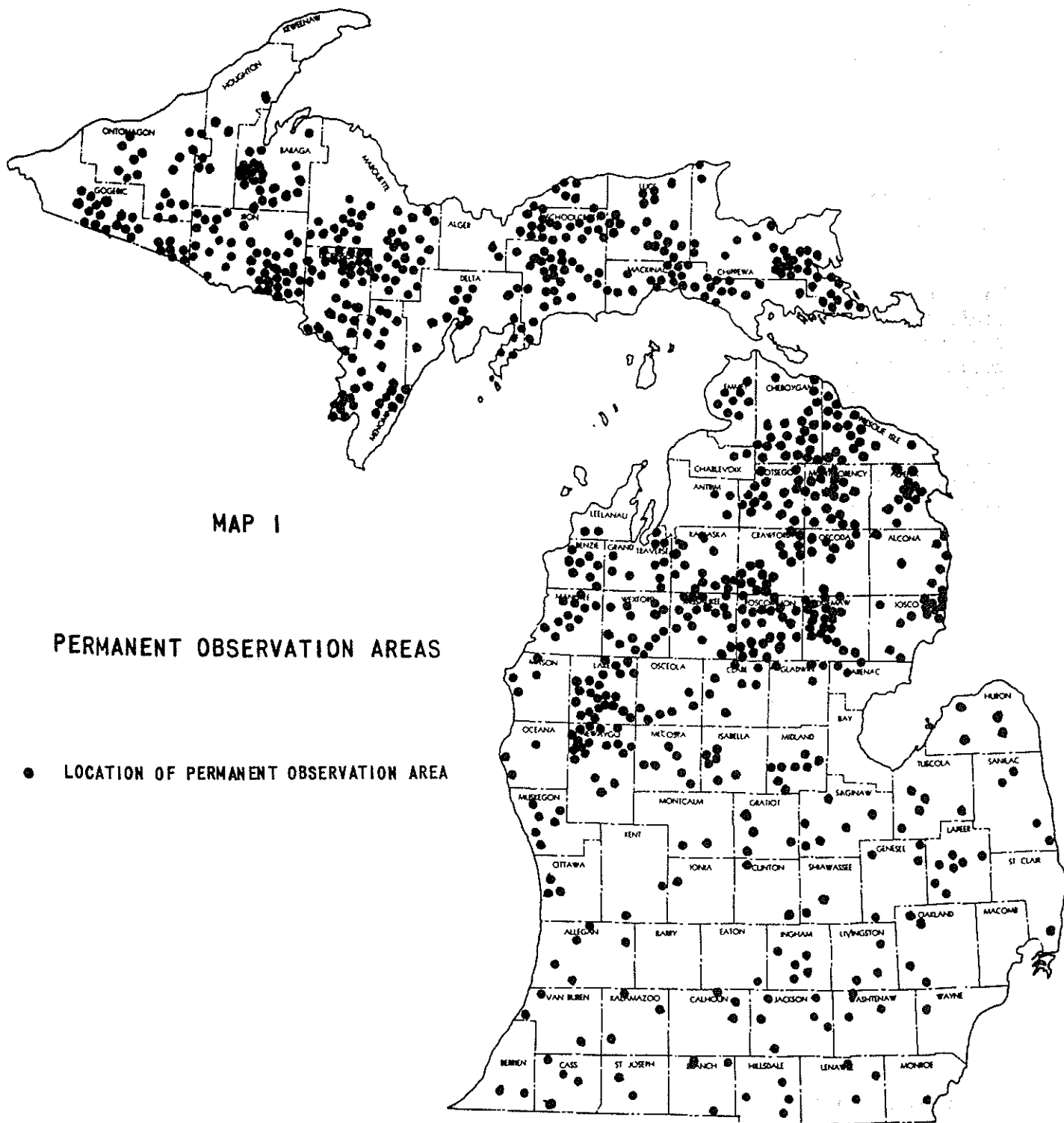
Cooperation with neighboring states in regional activities is an important part of the program. The eleventh annual Lake States Forest Insect Work Conference was held in Minneapolis in February with representatives of federal, state, and private agencies participating. The major problems confronting this group are the standardization and coordination of survey techniques and activities in Minnesota, Wisconsin, and Michigan, and the measurement of insect damage.

Close coordination between corresponding agencies in the Great Lakes region has been possible through the Central International Forest Insect and Disease Conference. At this conference, entomologists, pathologists, and foresters from the three Lake States and adjoining Canadian Provinces are able to discuss mutual forest pest problems and present research findings. The tenth meeting of this conference was held in September at Sault Ste. Marie, Ontario.

On December 13, 1961 the annual meeting of the Michigan Forest Pest Detection Program committee was held in Lansing to review the work carried on during the year by the various agencies concerned with surveys, control and research, to discuss the annual report, and to make plans for 1962. Those in attendance were:

- L. E. Bell, Forestry Department, M.S.U.
- R. W. Blair, Packaging Corporation of America
- J. W. Butcher, Department of Entomology, M.S.U.
- J. B. Cody, Kimberly-Clark Corporation
- P. R. Flink, Michigan Department of Conservation
- S. A. Graham, School of Natural Resources, U. of M.
- F. B. Knight, School of Natural Resources, U. of M.
- J. W. Leonard, Michigan Department of Conservation
- U. N. Martilla, U.S.F.S., National Forests
- W. E. Miller, U.S.F.S., Lower Peninsula Research Center
- A. F. Monroe, Soil Conservation Service
- L. H. Moore, U.S.F.S., Regional Office
- J. C. Nord, School of Natural Resources, U. of M.
- W. R. Ringe, U.S.D.A., Plant Pest Control Division
- A. M. Rivas, U.S.F.S., Regional Office
- V. J. Rudolph, Forestry Department, M.S.U.
- N. F. Smith, Michigan Department of Conservation
- T. D. Stevens, Forestry Department, M.S.U.
- E. F. Totten, Consumers Power Company
- R. A. Yankee, Packaging Corporation of America
- W. J. Young, Michigan Department of Agriculture

Information for this report on the pest conditions on federal lands was obtained in part from the Lake States Forest Experiment Station and the U.S. Forest Service report, "Annual Regional Report on Forest Insects and Disease Conditions - Region 9" for 1961. The following report of activities of the Michigan Forest Pest Detection Program for 1961 was compiled by the Forestry Division of the Michigan Department of Conservation.



ORGANIZATION OF PROGRAM

Increasing awareness and concern about losses caused by insects and diseases to the forests of Michigan led to the beginning of a forest pest detection program in 1950. The program was outlined and organized by the Conservation Department with the cooperation of the U. S. Bureau of Entomology and Plant Quarantine (now the Division of Forest Insect Research, U.S. Forest Service), the U.S. Forest Service; the School of Natural Resources, University of Michigan; the Departments of Entomology, and Botany and Plant Pathology, and Forestry Extension Service, Michigan State University; the Division of Plant Industry, State Department of Agriculture.

The program involves more than the mere detection of forest pest outbreaks, its objectives being: (1) to detect the presence of forest insects and diseases, and to apprehend outbreaks by systematically and annually collecting records of occurrence and damage; (2) to facilitate and organize direct control in case of emergency; and (3) to provide a basis for protective measures by indirect means.

The detection framework is built principally around the field organization of the Forestry Division of the Conservation Department, which handles state and private lands and the U.S. Forest Service which handles federal lands. The general field plan for insects, insofar as the State Forestry Division districts are concerned, calls for the establishment of permanent observation areas scattered throughout each forest district on both state and private lands in timber stands where critical insects exist or are likely to appear. (See Map I.) Observation reports are submitted annually to the Lansing office of the Division, indicating the degree of infestation, or the absence, of each of the critical insects on the designated plots. Those critical insects found only in the southern part of the state are not reported on in the northern regions, and vice versa. Thus, each district forester has only six to eight critical insects to observe.

The two educational institutions participate in training programs and act in an advisory capacity on insect and disease identification and control measures, as does also the Division of Forest Insect Research of the U. S. Forest Service.

The State Department of Agriculture, through its Division of Plant Industry, is directly concerned in the program by virtue of its statutory authority to establish quarantines, to enter on private lands for purposes of inspection, and, where necessary, to compel or provide for the control of serious insect pests and contagious plant diseases.

The disease phase of the program does not follow the same routine as applied to insects, since there are relatively few "critical" forest diseases requiring constant surveillance. Individual programs have been developed for the most important diseases with various state and federal agencies cooperating in survey and control work.

* * *

PROGRAM ACTIVITIES

INFORMATION RELEASES

A pocket-sized "Field Key to Michigan Forest Insects" was published in 1961. This field key contains illustrations of the important forest insects in Michigan and in many cases also includes damage, hosts, insect descriptions, and notes on the severity of damage. Sixty-two insects and three common diseases are covered by the field key.

No new pest information leaflets were issued in 1961 to add to the 20 issued from 1956 to 1958. Many requests continued to be received from cooperators, land owners, teachers and others for the separate leaflets and for "Michigan Forest Pests", which is the compilation of the separate leaflets.

Several special reports, in the form of general memorandums, were issued throughout the year whenever it was advisable to alert the cooperators to unusual conditions, new pests in their areas, time for control applications, results of control activities or other important information.

Suggested news releases were sent to the Department foresters for their use, saving them the time required to write such articles. The purpose of these news releases was to alert landowners to the potential pests, recommended control measures, and correct timing for spray application.

TRAINING SESSIONS

Training sessions on the important forest insects were held for the Conservation Department district foresters in conjunction with the divisional meeting in February. Programs on the identification and control of tree pests were presented at three Christmas tree growers' meetings.

COOPERATIVE REPORTS

The Michigan forest pest detection program helps to provide information for other cooperative reports as follows:

Lake States Forest Pest News Letter - A forest pest news letter covering the current status of the important forest pests in the Lake States was initiated in 1960 by the Lake States Forest Experiment Station at St. Paul, Minnesota. The purpose of the news letter is to enable entomologists, foresters, and others concerned, to keep abreast of the current pest situation. A summary of the current situation in Michigan, from information gained through the Michigan forest pest detection program reports and surveys, is submitted for use in each issue. One issue of the news letter was prepared in 1961 by the Lake States Forest Experiment Station before passing the responsibility for forest insect surveys to the Regional Office of the U.S. Forest Service on July 1.

Cooperative Economic Insect Report - Information on insect infestations and seasonal development is sent to Professor Ray Hutson, Department of Entomology, Michigan State University, who forwards it to the Plant Pest Control Division, Agricultural Service, U.S. Department of Agriculture, for inclusion in the Cooperative Economic Insect Report. This report is a weekly resumé of important insects in the United States and includes a section on forest insects.

Annual Regional Report on Forest Insect and Disease Conditions - Region 9, U.S.F.S. - Annually the forest pest situation in the Lake States is summarized by the U.S. Forest Service Regional Office in Milwaukee, Wisconsin from information submitted by the states and also collected by the Forest Service. The forest insect situation in Michigan as reported in the annual report of the Pest Detection Program is forwarded to the Station for inclusion in the Region 9 report.

Status Report on Forest Insect Conditions - The information compiled in the previously mentioned report by the U.S. Forest Service in Region 9 is included in the Status Report of the Forest Insect Conditions covering the United States and published annually by the Division of Forest Insect Research, Forest Service, U.S. Department of Agriculture in Washington, D.C.

* * *

COOPERATORS REPORTS

Cooperators aid in the detection program by reporting on insect conditions in areas not covered by state foresters, thus helping to present a better overall picture of the forest insect situation in the state.

The following cooperators submitted reports on observations during 1961:

Kimberly-Clark Corporation
Michigan State University
North American Timber Company, Packaging Corporation of America
Oliver Iron Mining Division, U.S. Steel Corporation
Plant Industry Division, Michigan Department of Agriculture
U.S. Forest Service
University of Michigan

* * *

OBSERVATION REPORTS

A total of 2,125 observation reports was received and analyzed by the Lansing office of the Forestry Division and of this total, 2,090 reports were on the critical insects. This represents an increase of 376 reports over those received in 1960. The increase is due to the addition of new observation areas by Conservation Department foresters and the active participation in establishing and reporting on national forest observation areas by the U.S. Forest Service.

Observation area specifications were sent to cooperators with a request that all areas be checked for current suitability. As a result, 49 Conservation Department observation areas were dropped in 1961 because they had outgrown the most susceptible size and were no longer suitable for the insects to be reported. These were replaced and added to with 76 new areas bringing the total observed by Conservation Department foresters to 677. In addition to these, 23 areas were checked by industry and 108 areas were established in 1961 by the U.S. Forest Service. The total number of observation areas is now 808. (See Map 1)

* * *

CRITICAL INSECTS

The list of critical forest insects in Michigan has been changed from time to time to include actively or potentially injurious insects and to remove from the list those which are no longer considered thus.

The insects on the critical list are those on which regular observation area reports are submitted. During 1961, the following insects were on the critical insect list:

Insect	Area Reporting (1 Upper Peninsula, 2 Northern Lower Michigan, 3 Southern Lower Michigan)
European pine sawfly	3
European pine shoot moth	2,3
Forest tent caterpillar	1,2
Saratoga spittlebug	1,2
Anomala beetle	2
Jack pine budworm	1,2
Spruce budworm	1
Larch sawfly	1,2
White pine weevil	1,2,3
Red-headed pine sawfly	1,2

At the December 1961 meeting of the Michigan Pest Detection Program Committee, it was decided to add the Zimmerman pine moth and the pine root collar weevil to the list of critical insects for 1962.

Following are reports of critical insects for 1961:

JACK PINE BUDWORM - Choristoneura pinus Free.

Observation reports and surveys showed an increase in the severity of jack pine budworm defoliation in Michigan, especially in the Upper Peninsula. In 1960 there were no observation areas reported with heavy defoliation and only one with medium defoliation. In 1961, 12 observation areas were reported as heavy and 9 as having medium defoliation. In general, the budworm population remained at a low level for the fourth year in Lower Michigan, with the exception of southeastern Grand Traverse, Lake, and Mason counties. (See Map II).

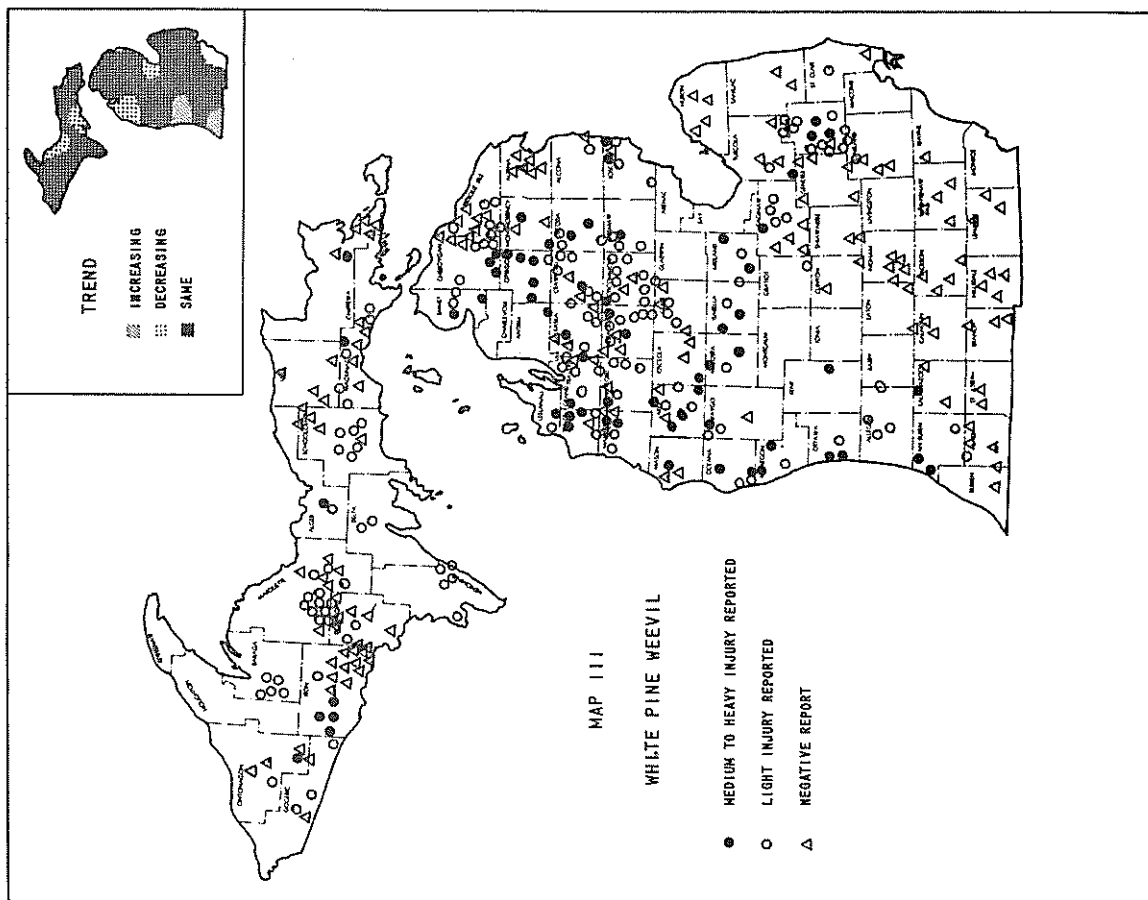
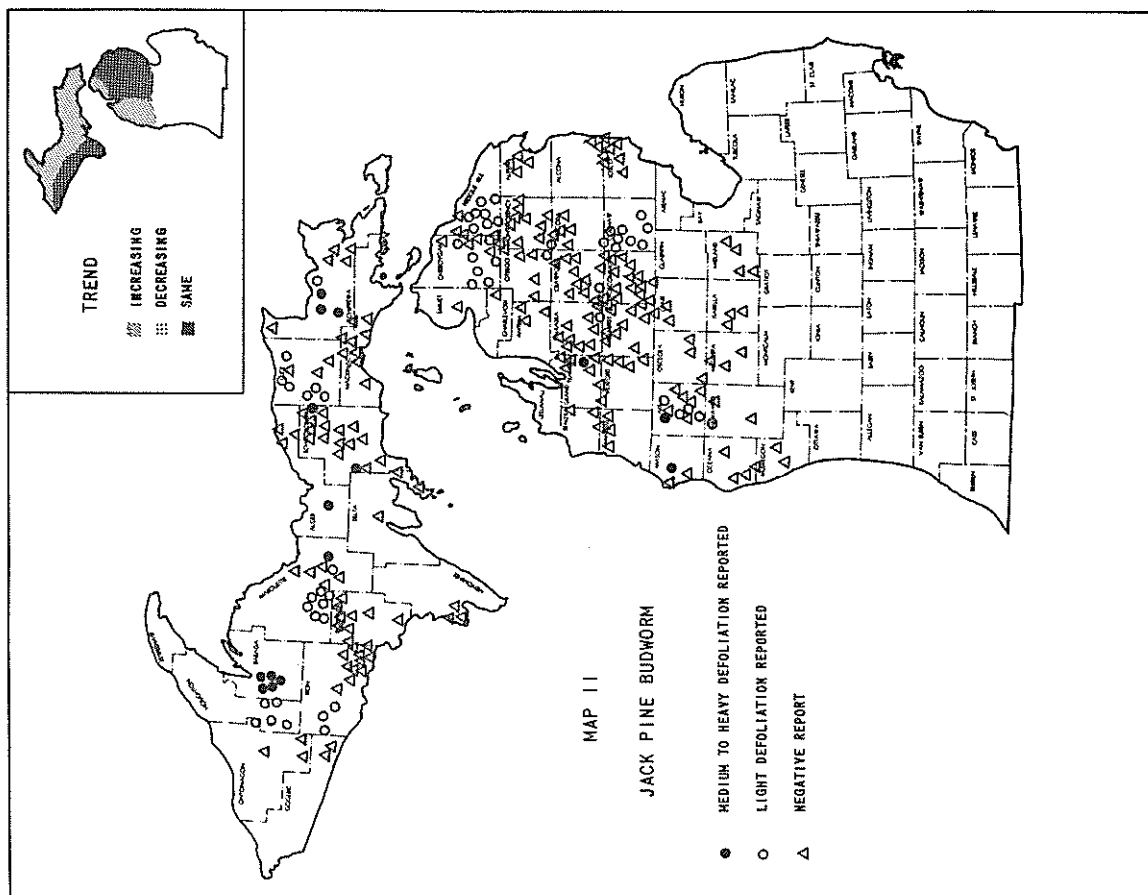
In the Upper Peninsula, severe defoliation occurred on the Baraga plains in western Baraga County, in central Marquette County north of Gwinn, in western Luce County, and on the Upper Michigan National Forest in Schoolcraft and Chippewa counties. (See Fig. 1).



Fig. 1

Heavy jack pine budworm defoliation occurred in the Upper Peninsula and in Grand Traverse County in Lower Michigan.

Michigan has had a history of jack pine budworm outbreaks and generally these have subsided without causing widespread tree mortality. The previous outbreak that occurred in the early 1950's resulted in some trees being killed but not whole stands. In the early 1950's soil moisture conditions were good and this is probably an important factor in the small amount of tree mortality. Although soil moisture is presently adequate in most areas, many of the trees are still in weakened condition from the prolonged drought



period from 1955 to 1959, and a budworm infestation at this time might cause considerable tree mortality.

Surveys and Control

Following the 1961 defoliation, and aerial survey by U.S. Forest Service and Conservation Department personnel covered the major jack pine areas in the Upper Peninsula. Ground surveys were made in Lower Michigan. Follow-up ground surveys in the severe outbreaks indicated volumes and value of timber involved.

Two major areas of state land that are involved in infestations and that will probably need to be sprayed if the trees are to be saved, are on the Baraga Plains in Baraga County and the Boardman Plains in Grand Traverse County. Approximately 4,121 acres of merchantable or potentially merchantable jack pine are seriously infested on the Baraga Plains. This area contains a volume of 20,605 cords of jack pine. The trees are straight and well-formed, 25 to 35 years old, and the stocking is good.

On the Boardman Plains in Grand Traverse County 2,625 acres of 25-40 year old jack pine plantations containing 17,260 cords, and 1,060 acres of 40 plus year old natural jack pine are involved in the area of state land proposed for spraying in June 1962,

The U.S. Forest Service is watching, through aerial and ground surveys, 4,000 acres of infested jack pine on the Ottawa National Forest and 56,000 acres on the Upper Michigan National Forest. In addition, the Lower Michigan National Forest has a lesser infestation of the budworm under surveillance, but is believed that it can be handled through cutting where necessary.

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	135	185	232	280	291	276	267	269	246	244	301
% Positive..	38	40	32	20	20	29	22	19	14	11	28

Breakdown of 1961 Reports

Heavy defoliation (61-100%).....12.....(14%)
 Medium defoliation (21-60%).....9.....(11%)
 Light defoliation (1-20%).....63.....(75%)

WHITE PINE WEEVIL - *Pissodes strobi* (Peck)

A cool spring was probably responsible for reducing the number of white pine weevils this year. In many areas the damage was less than in previous years but still high enough to cause serious deformation of red, jack and Scotch pines. Particularly noticeable was the smaller number of weevil larvae per infested tip, in many cases not a large enough number to girdle the tree leader.

Infestations of over 40 percent of the trees were reported in Alger and Ontonagon counties in the Upper Peninsula, and Emmet, Cheyboygan, Otsego, Leelanau, Benzie, Grand Traverse, Kalkaska, Missaukee, Lake, Mecosta, Midland, Newaygo, Muskegon, Tuscola, Ottawa, Allegan, and Kalamazoo counties in Lower Michigan. The heaviest concentration of weevil damage is in northern Lower Michigan, although, with the exception of extreme southeastern Michigan, weevil damage can be found almost everywhere its hosts are found. (See Map III).

It is expected that the weevil populations will again build up in 1962 to the high damaging levels of previous years.

Control

Control on state land using inmate labor with back pack sprayers has been very successful, reducing the weeviled tops to less than one-half percent of the trees. The jack pine on eight forties on the Fife Lake State Forest totaling 204 acres was sprayed in April 1961. The misshapen and forked trees on 172 acres were clipped before they were sprayed. The object of the clipping was to restore the trees to a single stemmed tree. This was necessary as the multiple leadered trees could not be adequately covered during the spraying with the insecticide.

During late summer the weeviled jack pine tops on 76 acres were clipped and burned by inmate crews. This does not prevent damage during the year of clipping but is used to reduce the population present for attacking the trees the following year.

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	39	33	231	278	319	306	317	335	333	306	385
% Positive..	82	64	65	59	60	53	56	62	58	62	59

Breakdown of 1961 Reports

Heavy injury (41-100% of leaders killed).....22.....(10%)
Medium injury (11-40% of leaders killed).....54.....(24%)
Light injury (1-10% of leaders killed).....152.....(65%)

EUROPEAN PINE SHOOT MOTH - *Rhyacionia buoliana* (Schiff.)

European pine shoot moth populations were a little heavier than in 1960 and were particularly serious in the southern half of Lower Michigan and northward in the counties nearest the Great Lakes. A general decline was noted in the shoot moth infestations in 1958 and 1959 with a slight increase in 1960 and a more pronounced increase in 1961. Many trees were able to recover during the low period in 1958 and 1959 and even though they are still being attacked, they are outgrowing the damage. Infestations persist in some of the colder portions of the state, although the damage is slight.

The comments of the district foresters, "Good recovery of red pine," "The recovery of this plantation from very serious damage is phenomenal," etc., reflect an optimism not evident five or six years ago.

Heavy damage was reported in most of the southern Lower Michigan counties, and Mason and Wexford counties in the northern half. (See Map IV). The shoot moth is known to be present throughout Lower Michigan and in Chippewa, Luce, Mackinac, Schoolcraft, Delta and Houghton counties in the Upper Peninsula.

Control

Immature labor was used to spray red pine on 128 acres with back pack sprayers on the Fife Lake State Forest.

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	44	80	119*	203	207	258	242	229	225	238	269
% Positive..	80	40	47	39	49	42	48	51	52	44	48

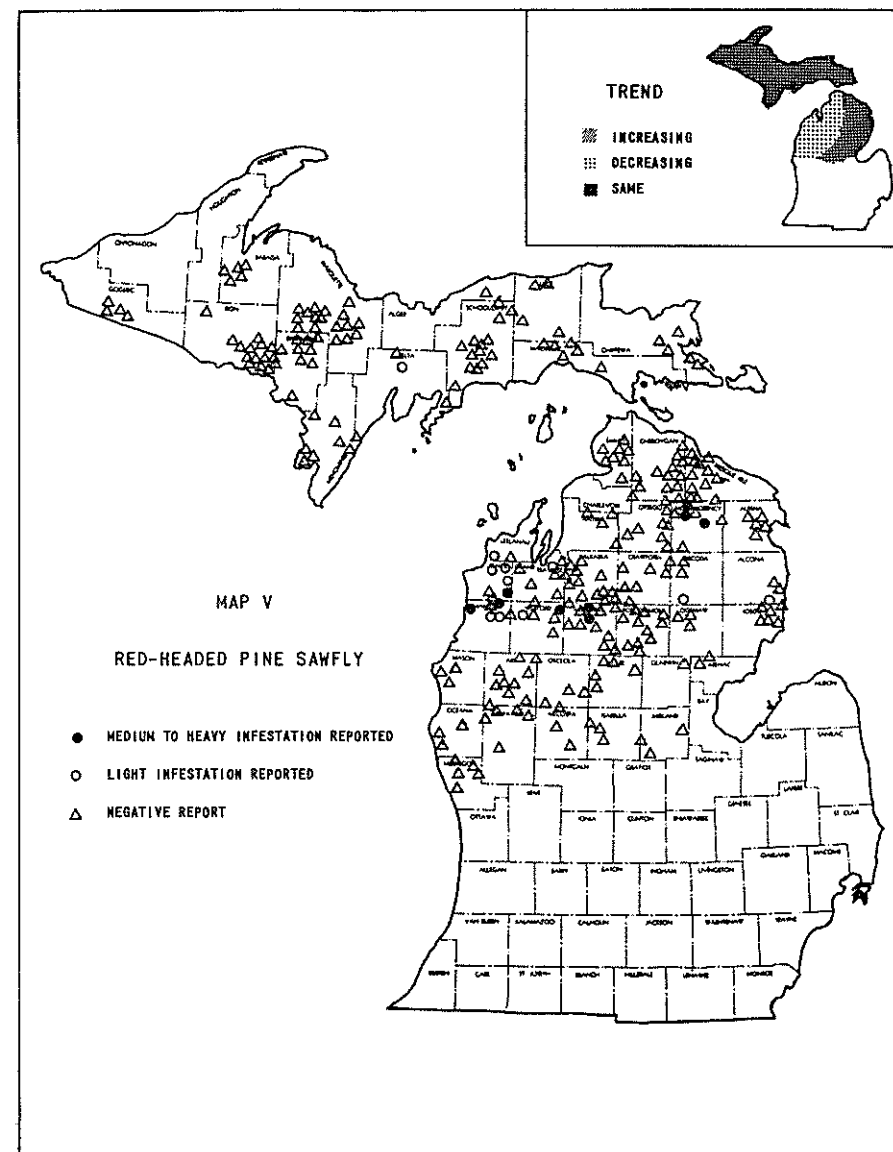
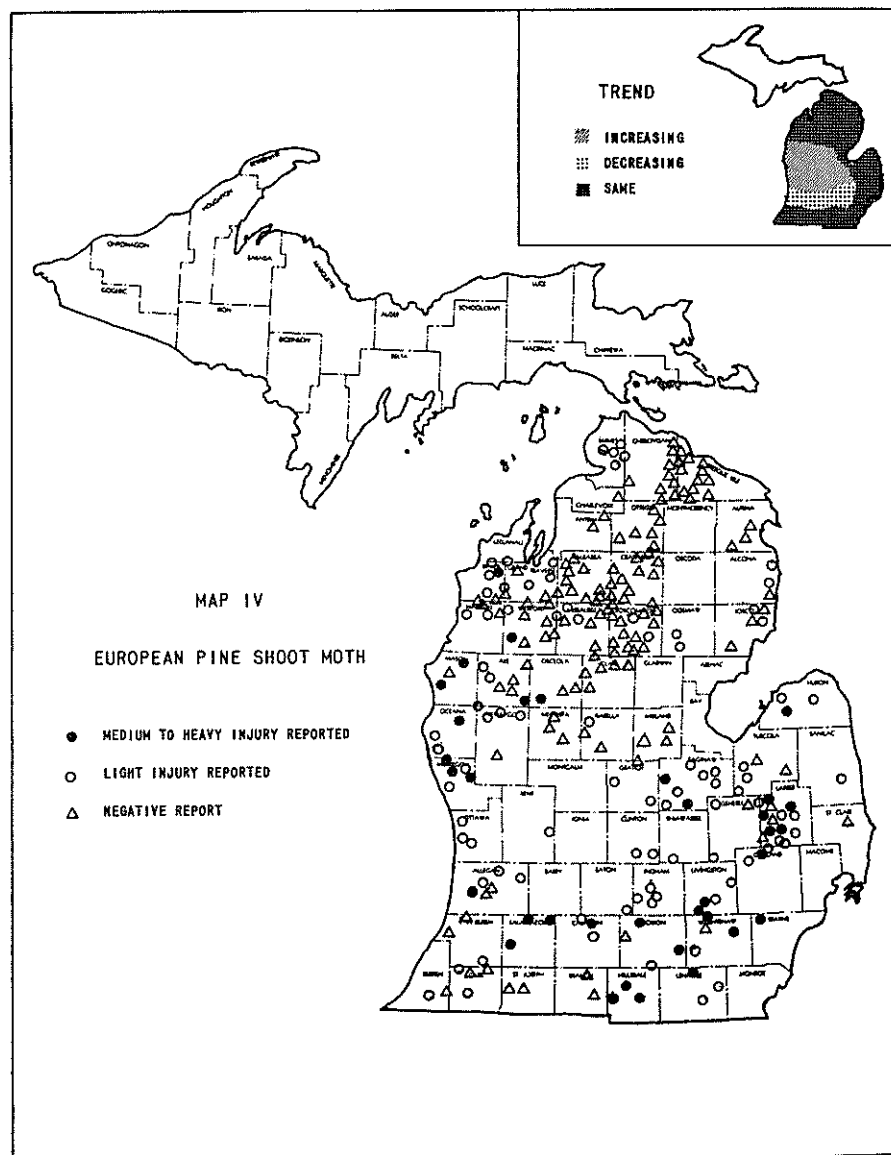
*Increase due to inclusion of insect on critical list of districts in northern half of Lower Peninsula.

Breakdown of 1961 Reports

Heavy injury* 30.....(23%)
Medium injury* 8.....(6%)
Light injury* 92.....(71%)

*Degree of injury = "I" = $\frac{\% \text{ of susceptible trees attacked} \times \% \text{ of tips infested}}{100}$

Heavy if "I" is greater than 20
Medium if "I" is between 10 and 20
Light if "I" is less than 10



RED-HEADED PINE SAWFLY - *Neodiprion lecontei* (Fitch)

A sudden collapse in the red-headed pine sawfly population in northwestern Lower Michigan resulted in the cancellation of the proposed spraying operation on state land. Some of the sawfly infestations continued but overall, the population was the lowest it had been in several years. The eggs were laid in sufficient numbers in many areas to cause considerable defoliation but they did not hatch.

This insect has been cyclic in the past with recent serious outbreaks occurring in the mid-1930's and mid-1940's. It is on the downward part of its cycle at present. Future outbreaks are going to be more difficult to detect and control because of the nature of the recent plantations which are generally smaller, more isolated spots of odd shapes. Earlier areas planted were larger, open areas.

Moderate injury was reported in Montmorency, Manistee, Benzie, Wexford, and Missaukee counties. (See Map V).

Surveys and Control

A survey was made in red and jack pine plantations, that were known to be infested in 1960, in Missaukee, Manistee, Kalkaska, Benzie, Grand Traverse, Crawford, Antrim, Leelanau, Cheboygan, and Emmet counties. These plantations were located in approximately 80 forties. Egg counts indicated that sawfly populations on 13 forties in Emmet and Cheboygan counties, totaling about 350 acres of actual plantation, would be high enough to cause serious defoliation. These areas were scheduled for aerial spraying.

However, surveys immediately prior to the spraying disclosed that the eggs failed to hatch due to parasites and other factors, and the control operations were cancelled. For the first time since 1956, no pine plantations were sprayed for red-headed pine sawfly on state land in 1961.

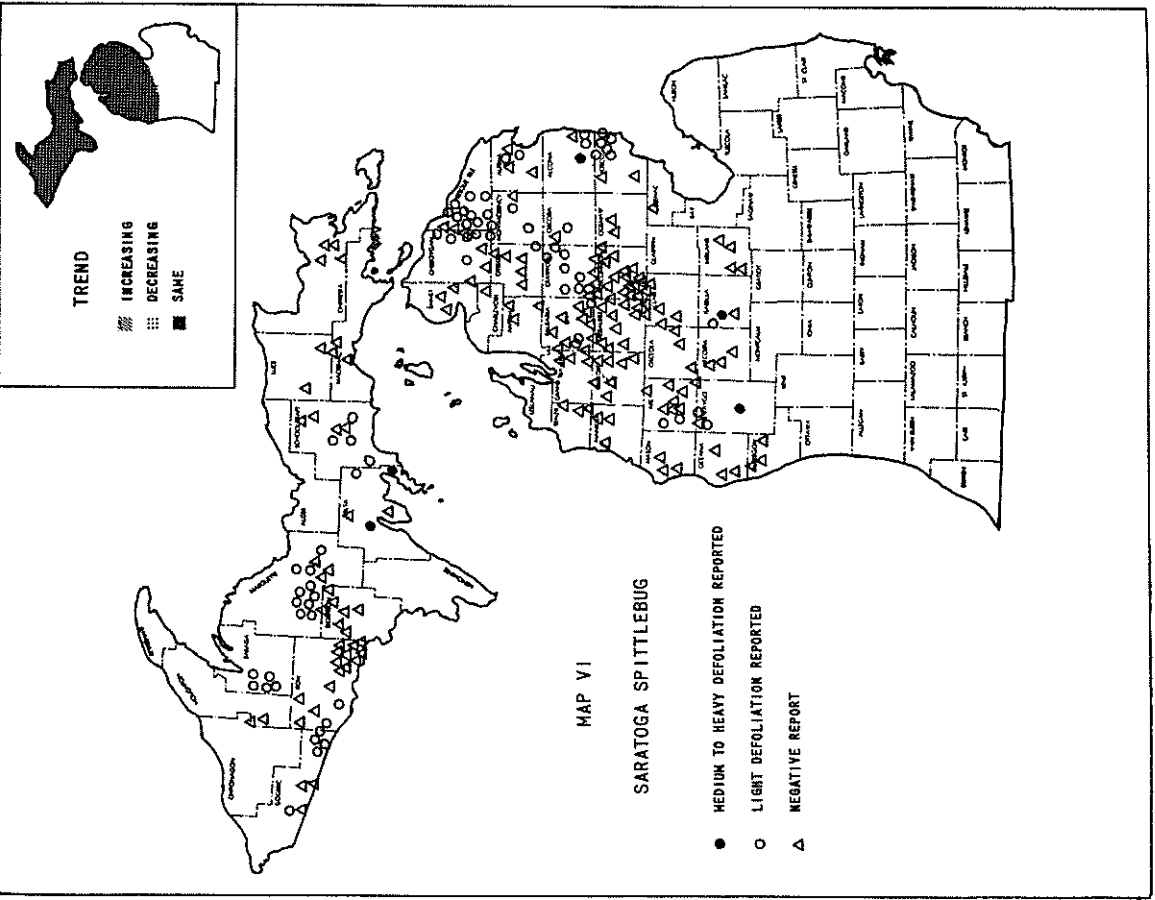
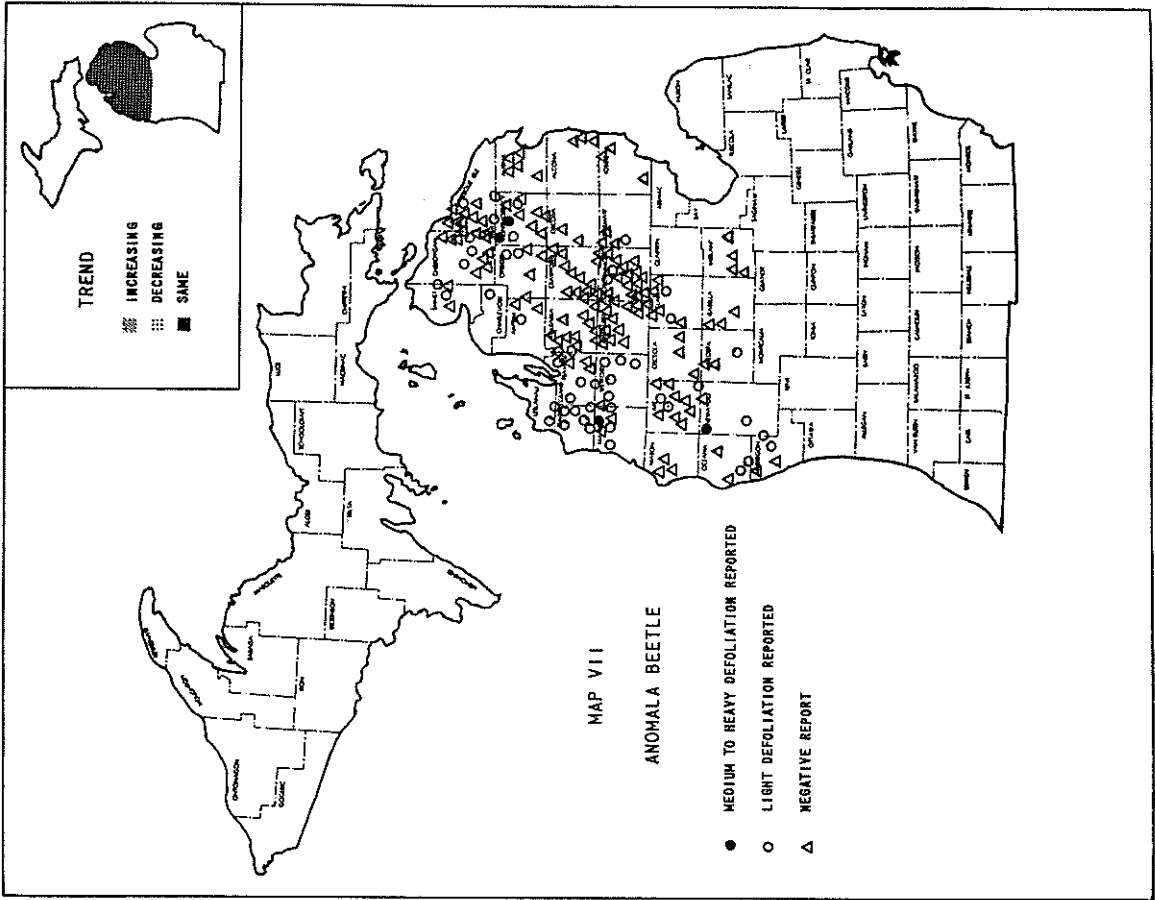
No spraying is being planned for the sawfly in 1962.

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	133	173	231	230	260	255	239	249	233	248	284
% Positive..	18	7	8	8	5	5	16	14	18	9	7

Breakdown of 1961 Reports

Heavy defoliation (11-100% susceptible trees attacked).....0.....(0%)
Medium defoliation (2-10% susceptible trees attacked).....9.....(43%)
Light defoliation (0-1% susceptible trees attacked).....12.....(57%)



SARATOGA SPITTLEBUG - *Aphrophora saratogensis* (Fitch)

The Saratoga spittlebug remained at about the same level as 1960 with serious damage occurring in some plantations. Moderate damage was reported on observation areas in Dickinson and Delta counties in the Upper Peninsula, and Alcona, Newaygo, and Isabella counties in Lower Michigan. Light damage was reported in most counties where plantations occur that contain an abundance of sweet fern with the pine. (See Map VI).

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	17	51	164	211	229	225	214	240	221	227	268
% Positive..	88	27	34	23	28	27	30	32	42	34	36

Breakdown of 1961 Reports

Heavy injury (61-100%).....0.....(0%)
Medium injury (21-60%).....3.....(3%)
Light injury (1-20%).....94.....(97%)

ANOMALA BEETLE - *Anomala obliqua* Horn

Anomala beetles in northwestern Lower Michigan were heavier than in several years and caused much concern among Christmas tree growers. Many private plantations were sprayed, generally with good results. Several plantations on state land were reported as being severely defoliated by the beetles but were not sprayed. Defoliation of over twenty percent of the trees was reported in plantations in Montmorency, Manistee and Newaygo counties. (See Map VII).

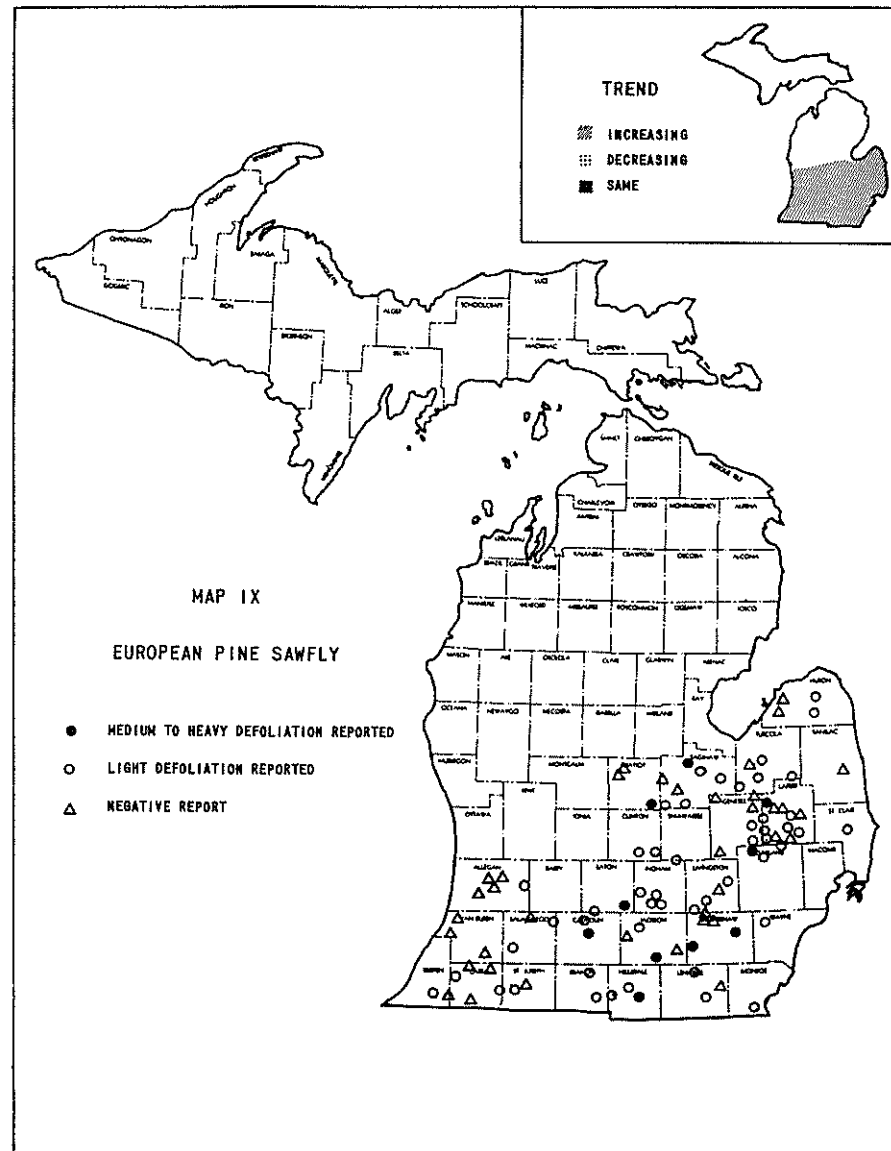
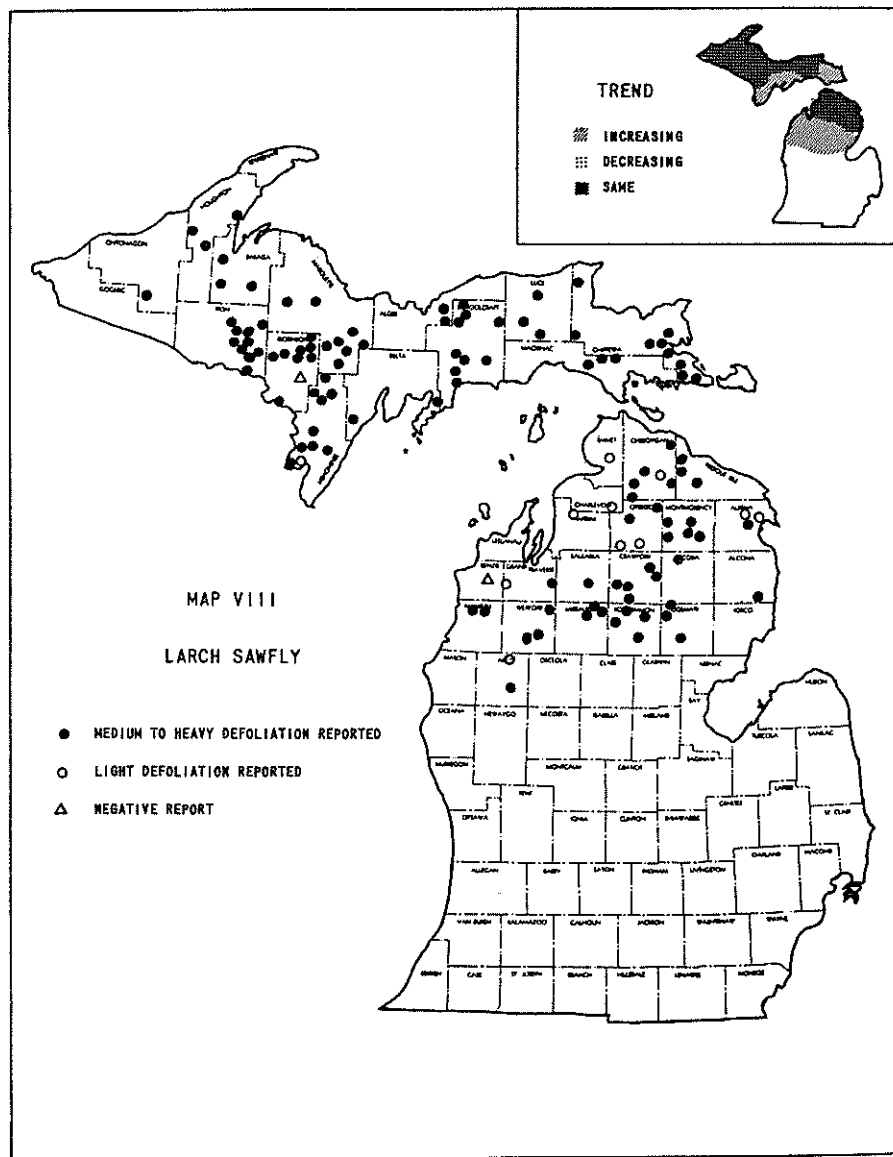
Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	119	181	236	278	275	271	269	243	239	140	203
% Positive..	35	36	32	38	38	37	22	14	14	29*	28

*The apparent increase in percent of positive reports is due to the dropping of observations for this insect in the Upper Peninsula where it has never been found.

Breakdown of 1961 Reports

Heavy defoliation (61-100%).....0.....(0%)
Medium defoliation (21-60%).....4.....(7%)
Light defoliation (1-20%).....53.....(93%)



LARCH SAWFLY - *Pristiphora erichsonii* (Htg.)

Larch sawfly populations have fluctuated up and down from stand to stand. For the past few years many stands showed complete defoliation while nearby stands were only lightly defoliated. Reports were received of top killing and tree mortality. However, generally, the stands are continuing to survive, although in a weakened condition with slower growth.

The severity of defoliation increased somewhat in the eastern part of the Upper Peninsula and in northern Lower Michigan, although it was still below the high reached in 1959. During 1959, 60 percent of the positive reports indicated heavy defoliation. This dropped to 34 percent in 1960 and has risen to 39 percent in 1961.

Only two negative reports were received for the larch sawfly, one in Dickinson County and the other in Benzie County. (See Map VIII).

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	68	113	137	135	145	140	133	131	118	116	130
% Positive..	0	30*	42	73*	66	81	85	95	97	99	99

*The apparent increase is largely due to intensified surveys rather than build-up of insect populations.

Breakdown of 1961 Reports

Heavy defoliation (61-100%).....50.....(39%)
Medium defoliation (21-60%).....67.....(52%)
Light defoliation (1-20%).....11.....(9%)

EUROPEAN PINE SAWFLY - *Neodiprion sertifer* (Geoff.)

Defoliation by the European pine sawfly greatly increased in 1961 and was the heaviest in recent years. Scotch pines up to 20 feet tall were completely defoliated of old needles in some areas, particularly in the southeastern part of Lower Michigan.

Heavy defoliation was reported in Gratiot, Oakland, Calhoun, Jackson, Washtenaw, and Hillsdale counties. (See Map IX). Many of the plantations in the southern portion of Lower Michigan are sprayed, thereby helping to keep this sawfly from causing more serious defoliation.

A supply of the virus disease for controlling the sawfly was obtained from the Central States Forest Experiment Station and was used in plantations in Clinton, Calhoun and Cass counties. Control was successful and the use of the virus will be extended to other plantations in 1962. The virus is specific for the European pine sawfly, is not harmful to humans or other organisms, and can be readily produced by collecting the diseased larvae and allowing them to rot in water overwinter.

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	31	64	85	82	111	100	104	91	97	89	96
% Positive..	87	69	74	75	74	62	56	59	48	57	61

Breakdown of 1961 Reports

Heavy defoliation*.....7.....(12%)
 Medium defoliation*.....3.....(5%)
 Light defoliation*.....49.....(83%)

*Degree of defoliation = "D" =

$$\frac{\% \text{ of susceptible trees attacked} \times \% \text{ of defoliation}}{100}$$

Heavy if "D" is greater than 24
 Medium if "D" is between 9 and 24
 Light if "D" is less than 9

FOREST TENT CATERPILLAR - *Malacosoma disstria* Hbn.

Forest tent caterpillars were found in many maple stands in the northwestern Lower Michigan counties of Kalkaska, Grand Traverse, Antrim, and Cheboygan. This probably indicates a build-up of this insect. The build-up is not yet apparent in the aspen observation areas.

The finding of the caterpillars in maple stands may indicate that the next outbreak will be on maple. During the widespread infestation in the early 1950's, aspen was the primary host species in the Lake States. In adjacent Ontario to the east and in New York State, maple was the principal host. At present, the maple defoliation was not heavy enough to be noticeable; however, the caterpillars could be found without much searching.

No signs of an increase in the population were noted in the Upper Peninsula.

FOREST TENT CATERPILLAR (Cont'd.)

Summary of Reports

	1954	1955	1956	1957	1958	1959	1960	1961
Total.....	117	120	111	111	109	119	113	130
% Positive.....	23	17	5	4	0	3	3	2

Breakdown of 1961 Reports

Heavy defoliation (61-100%).....0.....(0%)
Medium defoliation (21-60%).....0.....(0%)
Light defoliation (1-20%).....3.....(100%)

SPRUCE BUDWORM - Choristoneura fumiferana (Clem.)

Spruce budworm continued at the same endemic levels with no areas of outbreaks reported in Michigan. Budworm caterpillars could be found in many spruce-fir stands but no noticeable defoliation was reported.

Summary of Reports

	1956	1957	1958	1959	1960	1961
Total.....	40	29	30	25	30	24
% Positive.....	2	3	3	0	0	0

Breakdown of 1961 Reports

Heavy defoliation (61-100%).....0.....(0%)
Medium defoliation (21-60%).....0.....(0%)
Light defoliation (1-20%).....0.....(0%)

* * *

OTHER IMPORTANT INSECTS

GYPSY MOTH - *Porthetria dispar* (L.)

The following information on the gypsy moth is taken from the 1961 Annual Report of the Gypsy Moth Eradication Program of the Michigan Department of Agriculture, Plant Industry Division.

No moth recoveries were made in the summer of 1960, and therefore control measures were not necessary in the spring of 1961. Two recent developments have substantially reduced the cost and increased the efficiency of the gypsy moth trapping program; the synthesis and production of an artificial sex attractant, and the development of disposable paper traps.

The trapping program in Michigan began on June 26 with the assembling of the traps and was completed on September 1, after all of the traps had been taken down. Each trap had a normal attracting radius of one-half mile. The 1961 trapping program was conducted in the following counties:

Calhoun	54	square miles
Clinton	388	" "
Eaton	489	" "
Ingham	520	" "
Ionia	77	" "
Jackson	6	" "
Shiawassee	40	" "
Total	1,574	square miles

Only two moths were trapped and these were located in adjacent traps in Onondaga Township of Ingham County. As a result of these two finds, it will be necessary to spray these sites in the spring of 1962. This will encompass a five and one-half square mile area amounting to approximately 3,520 acres. The number of acres actually treated will be less than the total area involved, since only woodlots and fence rows will be sprayed.

PINE ROOT COLLAR WEEVIL - *Hylobius radicus* Buch.

Pine root collar weevil populations are increasing and killing red, jack, and Scotch pines in plantations. Damage is particularly severe in northwestern Lower Michigan. (See Figs. 2 and 3). Unfortunately, at the present time, there is no economical control method for use in protecting the trees against the root collar weevil. Only by avoiding planting on sandy soils can the damage be lessened.

OAK LEAF MINER - *Cameraria* sp.

Browning of oak leaves caused by the oak leaf miner was noticeable in Newaygo and Muskegon counties and elsewhere in Lower Michigan.



Fig. 2

Red pine killed by pine root collar weevil and then blown over. Trees planted in 1937 in Kalkaska County.



Fig. 3

Close-up of root crown showing galleries of pine root collar weevil.

OAK SKELETONIZER - *Bucculatrix ainsliella* Murt.

Oak skeletonizer injury was heavier than in recent years in Lower Michigan and especially in the western counties. This insect periodically becomes abundant locally but has little or no effect on the trees. The appearance of the white cocoons on trees, shrubs, houses, etc. often causes alarm to those unfamiliar with the insect.

SPRING CANKERWORM - *Paleocrita vernata* (Peck)

Elms in parts of Grand Traverse, Benzie and Kalkaska counties were completely defoliated by spring cankerworms.

ROSE CHAFERS - *Macrodactylus subspinosus* (F.)

Rose chafers are common every year but seldom cause any noticeable damage. However, in parts of Gladwin County, the feeding on Scotch pine leaders was heavy enough to cause crooking of the newly formed leaders.

A PINE TIP MOTH - Rhyacionia adana Hein.

Rhyacionia adana is generally distributed throughout most of northern Lower Michigan and the Upper Peninsula. Fortunately, the tip killing is confined to young trees so that as the trees reach about three feet in height, serious damage ceases. This insect is responsible for some of the forking of planted pines.

WHITE GRUBS - Phyllophaga spp.

White grubs are responsible for killing many newly planted trees and reducing the stocking below the minimum acceptable level. In addition to killing the trees, the roots may be damaged so that growth is severely reduced and the trees become more susceptible to other insects and diseases.

Prevention of the grub damage can be accomplished during tree planting by spraying the roots and soil with an aldrin solution from a sprayer attached to the planting machine or by dipping the roots in an aldrin solution prior to hand planting.

During 1961 the following acreages were treated for white grub control:

Planting using machine mounted sprayer

Grand Sable State Forest	2,476 acres
Mackinac State Forest	276 acres
Pigeon River State Forest	20 acres

Replanting with roots dipped in solution

Pigeon River State Forest	726 acres
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Planting with roots dipped in solution

Pigeon River State Forest	163 acres
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Dipping the trees protects the roots for at least the first growing season. Spraying the roots and adjacent soil protects the trees for four growing seasons. On the Lake Superior State Forest, after four growing seasons, 10 percent of the treated trees have been killed as compared to 61 percent of the unsprayed trees. On the check areas on the Grand Sable State Forest, grubs killed 33 percent of the trees planted in the spring of 1961. Only three percent of the treated trees were killed.

ZIMMERMAN PINE MOTH - Dioryctria zimmermani (Grote)

Zimmerman pine moth larvae can be found throughout Michigan, although the most serious damage has been to Scotch pine Christmas trees in southern Lower

Michigan. The moths are attracted to the pitch on the sheared trees, thus becoming the most serious problem where the most intensive Christmas tree culture is practiced. Ottawa and Allegan counties are the most heavily damaged areas with surrounding counties also with high populations.

Through most of the rest of the state, the pine moth caterpillars can be found on jack pine trees in the galls caused by the pine-oak or eastern gall rust fungus. Most of the injury is confined to these galls. Therefore, little damage is done to the trees.

PALES WEEVIL - Hylobius pales (Hbst.)

The pales weevil continues to be a problem to Christmas tree growers in Ottawa County where trees are planted in the vicinity of recently cut stumps.

BALSAM FIR SAWFLY - Neodiprion abietis (Harr.)

An increase in the severity of balsam fir defoliation by the balsam fir sawfly was noted along U.S. 2 from Naubinway to Epoufette in Mackinac County.



Fig. 4

Eastern tent caterpillars completely defoliated cherry trees in many areas in northwestern Lower Michigan

EASTERN TENT CATERPILLAR - *Malacosoma americana* (F.)

Cherry defoliation by the eastern tent caterpillar was heavier in 1961 than it had been since 1950. Trees up to 40 feet in height were completely defoliated and the tree trunks were covered with webbing. (See Fig. 4). The area of heaviest infestation was in northwestern Lower Michigan from Muskegon northward. Tents and caterpillars were found on aspen and other species of trees that are not normally eaten.

RED-HUMPED OAKWORM - *Symmerista canicosta* Franc.

Red-humped oakworms continued to cause defoliation of oak in a small area on the Allegan State Forest in Allegan County.

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DISEASES

OAK WILT

The following statement on the oak wilt situation in Michigan was prepared by the State Department of Agriculture.

"The oak wilt program in Michigan in 1961 has been carried on in the fashion similar to that used for the past four years. Probable infected trees are located by air survey and later checked on the ground and killed with a 2,4-D ester if infected with oak wilt. All similar type oaks within a 50 foot radius are also treated in this manner.

"This year, due to severely curtailed funds, only four counties were air surveyed. However, due to a considerable drop in the amount of oak wilt located, we were able to visit all 1960 infection sites. A total of 44 oak wilt infected trees was found at 26 locations. Of these, 18 were reinfected old locations and 8 were new locations.

"It is fairly difficult to compare the results of this year's program with that of years past because of the greatly curtailed operations. However, if the counties which were surveyed are compared, it is found that there 59% fewer infected trees and 54% fewer infection sites than in 1960. The total for the surveyed counties is the lowest since the inception of the program in 1956. These figures are promising, and it is hoped that a complete program will be able to be carried out in 1962." (See Map X).

DUTCH ELM DISEASE

A cooperative program of survey and control is coordinated by the State Department of Agriculture working with local units of government. This department is responsible for the survey and enforcement phase of the program, and the municipalities conduct the necessary sanitation and spraying. Laboratory facilities for diagnosing Dutch elm disease and oak wilt are maintained at Michigan State University; the laboratory is permanently housed in the State Department of Agriculture Chemical Control Laboratories Building.

The following statement regarding the 1961 Dutch elm disease program was taken from the 1961 Annual Report of the Dutch Elm Disease Control Program prepared by the State Department of Agriculture, Division of Plant Industry.

"Since this disease was discovered in 1950 in southeastern Michigan until the present, there have been many adjustments made in the approach toward the conduct of a good state-wide control program. At this time it is reasonable to say that the disease is present throughout the southern half of the lower peninsula. (See Map XI). It is becoming increasingly apparent that this spread will continue throughout the range of American elm in the state. It is economically impossible to control the disease in rural areas; thus, the present Dutch Elm Disease Control Programs are designed to function only within cooperating communities. No one can foretell what portion of the rural elm tree population will be lost, but recent observations would indicate that the loss will be very high.

"At the close of the 1961 season 40 counties in the southern half of the Lower Peninsula and two in the northern half were infected to some degree with Dutch elm disease. There is now an infection site at Carney, Menominee County in the Upper Peninsula. This is a direct result of a Michigan resident hauling disease-infected and beetle-ridden elm logs from Chicago to his place of business at Carney. An inspector of the State Department of Agriculture detected this situation and ordered the wood destroyed immediately. Unfortunately, disease transmission had already occurred before this could be accomplished, and in July a tree in the vicinity was determined by laboratory analysis to have the disease. It would seem that spread of the disease to the Upper Peninsula by natural means would be a very slow process; however, situations such as that which occurred at Carney will hasten it and possibly the entire peninsula will be infected more rapidly than anticipated.

"During the season just completed, 17,523 calls and contacts were made and 16,647 city blocks and 633 square miles were surveyed by inspectors of the Plant Industry Division. A total of 11,259 samples were submitted, with 9,982 diseased trees condemned and 6,326 dead trees condemned. These totals in no way represent the annual total loss of elm trees in the State, as recent surveys have not been conducted within rural areas for reasons which were previously mentioned."

In addition to the sanitation and control programs carried on by the municipalities, the Parks Division of the Conservation Department has had a Dutch elm

disease control program in its southern Michigan state parks and recreation areas since 1953.

The survey and sampling program is completed each year from June to September by the regular park personnel, along with help from the Michigan Department of Agriculture Dutch Elm Disease Identification Laboratory. One hundred and fifty-five samples were taken in 16 parks and recreation areas in southern Lower Michigan, and in the Bay City State Park in northern Lower Michigan. Laboratory reports indicated that 100 of the sampled trees were infected with Dutch elm disease. The infected trees were all removed and destroyed by burning.

Sanitation is carried on in the most important and developed parks and recreation areas by private contractor. In 1961, 2,135 trees were trimmed and 772 trees removed. This work involved the original treatment of the Bay City State Park, and reworking of the Highland, Holly, and Ortonville recreation areas.

Spraying of 12,307 elm trees was accomplished during the fall of 1960 and spring of 1961 to protect these trees from the disease.

WHITE PINE BLISTER RUST

A detailed report of the white pine blister rust situation and control program is prepared annually by the Area Leader for this cooperative federal-state project. A brief summary of this report for 1961 follows:

Ribes eradication for the protection of young white pine stands was continued to the full extent of available funds. Practically all labor was provided from Corrections Department Camps except on national forests. Trustee labor was made available from three camps in the Upper Peninsula, and four in the northern part of the Lower Peninsula.

During this eradication season, 19,000 acres of white pine were given protection by destroying 582,000 ribes on 33,900 acres of control area. An expenditure of 3,680 man days was required to do this work. Most of the control work was done on state forests.

At the present time there are about 513,200 acres of white pine and 1,365,000 acres of control area mapped in the northern counties. Considerable reseedling is taking place, so the inventory is not up to date. Approximately 48 percent of the mapped white pine is on maintenance and will require only an occasional examination. About 51 percent of the white pine on state forest is on maintenance, but only 36 percent for private ownership. The maintenance figure for national forests is about 82 percent.

Rust development was normal on ribes, although the season was delayed about two weeks. Aecia spore production was abundant and continued from the first week of May in southern Michigan to near the end of June around Gaylord. The majority of young cankers appeared on 1956 wood. 1957 infection is light while increasing numbers of cankers are appearing on 1958 wood.

* * *

OTHER CONDITIONS

FROSTS

Late spring frosts killed the new leaves on oaks in the north central part of Lower Michigan. This leaf killing was very noticeable in many of the valleys where all the new leaves were killed, particularly in parts of Missaukee, Kalkaska, Crawford, Otsego, and Antrim counties.

The killing of the new leaves causes much concern among land owners. However, refoitation generally occurs and the trees are not seriously affected.

WHITE PINE NEEDLE BLIGHT

White pine needle blight was common throughout the northern part of Michigan during 1961. Previous heavy needle browning occurred in 1957.

Needle browning is a physiological occurrence, according to Dr. L. White of the Canadian Department of Forestry, with neither insects nor disease organisms involved. The browning occurs when specific weather conditions take place - namely, a dry period of two or three weeks followed by rain. The time during the growing season when this takes place determines the amount of needle browning. In 1957, it came earlier in the summer and only the needle tips were killed. In 1961, it occurred in July, and therefore a much greater portion of the needle was affected.

The susceptibility to browning is inherited, with some trees showing needle browning every year, with more serious browning during certain years when the weather conditions are severe for the disease. Other trees never show any symptoms of the needle blight. Therefore, in any group of trees, some trees will be susceptible to the blight and others will not be affected.

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SUMMARY

Since 1950 the Michigan Forest Pest Detection Program has provided information on: (1) the presence or absence of the important forest pests in the state; (2) population trends of the pests; and (3) the areas where infestations necessitate more detailed surveys and possible control. Most of this information is received on the 2,125 observation reports submitted by foresters. Additional information is gained through letters, postal cards, and special surveys. Information on Dutch elm disease, oak wilt, gypsy moth, and white pine blister rust is provided by the Michigan Department of Agriculture and the U.S. Forest Service.

Jack pine budworm populations remained at a low level in Lower Michigan, with the exception of southeastern Grand Traverse, Lake, and Mason counties. In the Upper Peninsula, severe defoliation occurred in Baraga, Marquette, Luce, Schoolcraft, and Chippewa counties.

A cool spring was probably responsible for reducing the number of white pine weevils in some areas. However, the damage was still high enough to cause serious deformation throughout the range of its hosts.

European pine shoot moth populations were a little heavier than in 1960 and were particularly serious in the southern half of Lower Michigan and northward in the counties nearest the Great Lakes.

A sudden collapse in the red-headed pine sawfly population in northwestern Lower Michigan resulted in the cancellation of the proposed spraying operation on state lands. The population was the lowest it had been in several years.

The Saratoga spittlebug remained about the same level as 1960 with serious damage occurring in some plantations.

Anomala beetles in northwestern Lower Michigan were heavier than in several years and caused much concern among Christmas tree growers.

The severity of defoliation by the larch sawfly increased somewhat in the eastern part of the Upper Peninsula and in northern Lower Michigan, although it was still below the high reached in 1959.

Defoliation by the European pine sawfly greatly increased in 1961 and was the heaviest in recent years. Scotch pines up to 20 feet tall were completely defoliated of old needles in some areas in southeastern Lower Michigan.

Forest tent caterpillars were found in many maple stands in northwestern Lower Michigan, probably indicating a build-up of this species. No signs of an increase were noted in the Upper Peninsula.

Spruce budworm continued at the same low endemic level as in recent years.

No gypsy moths were trapped during the summer of 1960 and therefore control measures were not necessary during 1961. Two moths were trapped in 1961,

and approximately 3,520 acres will be sprayed in Ingham County in 1962.

Eastern tent caterpillars were particularly numerous in 1961, completely defoliating 40 foot tall cherry in many places in northwestern Lower Michigan.

The pine root collar weevil, pine sawflies, Zimmerman pine moth and other insects caused damage or defoliation of local concern.

Oak wilt surveys were greatly curtailed in 1961. However, in the counties surveyed, 59 percent fewer infected trees and 54 percent fewer infection sites were found than in 1960. The total for the surveyed counties is the lowest since the inception of the program in 1956.

Dutch elm disease is now present throughout the southern half of Lower Michigan and is expected to continue its spread throughout the range of American elm in the state. An infection site was discovered at Carney, Menominee County, in the Upper Peninsula. Communities carrying on a complete spray and sanitation program are showing a reduction in incidence of the disease. The spraying and sanitation program in the most important and developed protective areas of the state parks and recreation areas in the southern part of Lower Michigan is continuing.

White pine blister rust control work to protect 19,000 acres of white pine was done on 33,900 acres by destroying the ribes plants.

White pine needle blight was responsible for heavy needle browning throughout most of the northern part of Michigan in 1961.

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